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18 December 1963

MEMORANDUM FOR: Director of Logistics
THROUGH : Executive Officer, DD/SAT
SUBJECT : Air Conditioning Failures in OCS Computing Center

1. Since mid-November there have been a number of air conditioning failures in the Computing Center which have caused extensive computer down-time.
2. Support by the Computer Center to many parts of the Agency has been impaired by these air conditioning failures. Most serious, perhaps, our support to the Office of Special Activities has been handicapped. In view of the nature of our support to OSA, you will appreciate that this is of particularly grave concern. An extremely troublesome secondary effect of these air conditioning failures is the extra maintenance thus required by the computers. This additional maintenance, of course, adds to computer down-time.
3. Following is a summary which indicates the time that the IBM 7090 computer was not operable due to air conditioning failure or to maintenance required immediately thereafter in order to re-start the equipment. (Not shown are other machine down-times which the manufacturer feels were caused by damage to components caused during air conditioning failures.)

IBM 7090 INOPERABLE

Date	Air Conditioning	Follow-on Computer Maintenance
13 Nov	6.8	-
18 Nov	2.2	-
2 Dec	1.0	.2

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Date	Air Conditioning	Follow-on Computer Maintenance
4 Dec	1.0	1.0
6 Dec	4.5	1.4
7 Dec	4.7	-
12 Dec	5.8	-
13 Dec	.8	1.8
15 Dec	2.8	-

4. OCS and LSD/OL personnel have been attempting to resolve these difficulties, but failures continue. In view of the frequency of these failures and the seriousness of computer down-time to the Agency, I feel it is critical that the air conditioning system be corrected at the earliest possible date.

Joseph Becker
Assistant Director
Computer Services

cc: EO/DD/S&T

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Attachment II

Reasons for Selecting the IBM 7090 Computer
For CIA's Scientific Computing Requirements

I. Summary

Many of the Agency's scientific computing applications may be characterized as follows:

- (a) large-scale
- (b) tight real-time constraints
- (c) short deadlines
- (d) relate to external computing activities
- (e) involve advanced levels of decision theory.

The most immediate of the Agency's scientific computing support needs are those of the DD/R. The DD/R has requested an initial operational capability of August 1963. To achieve a scientific computing production capability within the next few months, it is necessary to choose an appropriately configured computer with large proven reliability, a computer already programmed by a large number of scientists/mathematicians, and, most important of all, a computer having extensive software in the fields most significant to the Agency. The IBM 7090 meets these specifications in far fuller measure than any other machine on the market.

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II. Hardware Considerations

A. Minimum specifications (with some possible trade-offs)

should be as follows:

1. Arithmetic rather than character type.
2. Minimum add time of 10 microseconds.
3. Minimum of 25k word memory. (Less memory throws many matrix programs onto auxiliary storage, thus blowing process time.)

(Most of the externally-generated source data which CIA will use in its various scientific computing applications will have been generated on 36-bit word machines. If CIA processes these data on other than 36-bit word equipment, discrepancies will occur between CIA results and the results obtained on the original 36-bit word equipment.)

4. Indirect addressing (real-time consideration).
5. Floating point.
6. Tape transmission speed of at least 50,000 characters per second. (Real-time considerations might raise this to 100-300 numerics per second.)

Several large-scale computers (not to count such very large-scale machines as STRETCH, LARC, and CDC-6600) meet the above specifications; e.g., Burroughs-B5000, CDC-1604, MH-1800, IBM-7044, PHILCO-2000, UNIVAC-1107, CDC-3600 and IBM 7090/94.

B. Reliability

The basic engineering of 1962-63 models of the above computers probably is top level. However, in an operational

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environment the reliability of a computer system will also be determined by (1) the compatibility of the central processor with its on-line peripheral gear, (2) the extent to which the reliability of all component parts has been proven through extensive and varied usage, and (3) experience and competence of the maintenance engineers.

- (1) The IBM 7090 system contains only IBM peripheral equipment. Thus, maximum compatibility is assured.
- (2) The IBM 7090 alone does about 60% of all scientific computing in the world and consequently is by far the most thoroughly checked out scientific computer available.

(This is a particularly important consideration when an early operational capability is required. Other less seasoned computers, although having features perhaps indicative of the next computer generation--such as, the Burroughs B5000 with its list, stack, and Polish notation features--are not acceptable as initial computers in a "crash" environment. Such machines should be analyzed carefully for possible subsequent incorporation, however, into an operating center.)

- (3) As for maintenance, there are more experienced maintenance engineers for the IBM 7090 than for any other machine. Also, the earlier workhorse for scientific computing, the IBM 704, is basically an IBM 7090

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prototype. Thus, not only do more trained engineers exist, but the average scientific computer experience level per IBM 7090 engineer is greater.

C. Special Hardware Considerations for CIA

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The IBM 7090 is an excellent data processor and is an ideal complement to the [REDACTED] IBM 1410 which is now servicing many CIA computing requirements. The IBM 7090 can run IBM 1410 programs through an available simulator WITHOUT REPROGRAMMING, and can share the SAME [REDACTED] disc file. (Solving of real-time problems within predicted future constraints may well depend on such sharing to provide manipulation of pre-computed tables.)

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III. Software Considerations

Software may be divided into four categories: (A) Systems Programs, (B) Manufacturer's Library, (C) Users' Libraries, and (D) Customer's Library.

As for systems programs, the IBM 7090 has the most sophisticated and thoroughly debugged programs of any large computer in the world. In the other three software categories, IBM 7090-type programs comprise about 90% of all available scientific software in the free world. Many hundreds of man-years of programming effort are available to the Agency if an IBM 7090 is acquired. And the machine costs for debugging and testing these programs can be considered equivalent to the labor costs. Thus, the IBM 7090 gives the Agency free access to millions of dollars

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of software. --In short, the software resources of the IBM 7090 are so great relative to comparable machines as to overwhelm any and all other considerations, given the nature of the Agency's needs, present and anticipated.

Most scientific programming in the U. S. is done in some version of FORTRAN (sometimes intermixed with symbolic machine code) which is the most used algebraic compiler language for the IBM 7090. Most unbiased students of machine scientific compiler languages consider FORTRAN somewhat inferior to ALGOL or ALGOL-type languages such as NELIAC, JOVIAL, MAD, etc. Academic circles commonly use ALGOL as the standard form of algebraic expression and communication. Yet when they actually run their problems on the machine, they use FORTRAN. Thus, de facto, FORTRAN as used on the IBM 7090 must be accepted as the scientific man-machine language standard, at least for the immediate and intermediate future.

A. Systems Programs

To reiterate, the IBM 7090 Systems Programs posture is without compare. These programs are too numerous to list. One example: the IBSYS Executive Processor monitors debugging and production and supplies all utility programs. FORTRAN IV, COBOL, and 9PAC (Report Generator which sorts before generating) are included in the IBSYS package.

B. Manufacturer's Library

The SHARE library contains approximately 1200 programs (mainly scientific) which will run on an IBM 7090. Most of these require modification to run on other machines.

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